2002

Field Trip Guide (for the Nebraska Well Drillers Association) Southwestern Nebraska Geology

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FIELD TRIP GUIDE

(for the Nebraska Well Drillers Association)

SOUTHWESTERN NEBRASKA GEOLOGY

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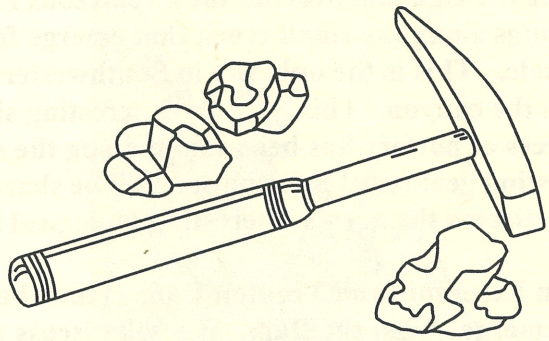

NEBRASKA GEOLOGICAL SURVEY

Conservation and Survey Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln

University of Nebraska Lincoln

July 31, 2002

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SOUTHWESTERN NEBRASKA
GEOLOGY FIELD TRIP
July 31, 2002

7:30 A.M. Meet in McCook at Holiday Inn Express for registration and preview of trip.

7:45 A.M. Leave McCook drive to Medicine Creek Dam following Highway 6 & 34 along the Republican River Valley. Drive by McCook Rest Area and notice that the water well is located approximately half mile east. Pierre shale is high at the rest area and 9 test holes were drilled in the area before a suitable well was found. Continue along the valley and discuss groundwater situations as we drive east. At the Dam we will view the Ogallala Formation that overlies the Cretaceous age Niobrara Formation Chalkrock and discuss local geology and its relation to groundwater situations in this area.

9:15 A.M. Leave and drive to Bartley Canal site. View Ogallala quartzite in county road and in the banks of the canal. Discuss implications of quartzite and possible drilling problems associated with the extremely hard quartzite. Geology and other locations of the quartzite in Nebraska will be discussed. Coffee will be available.

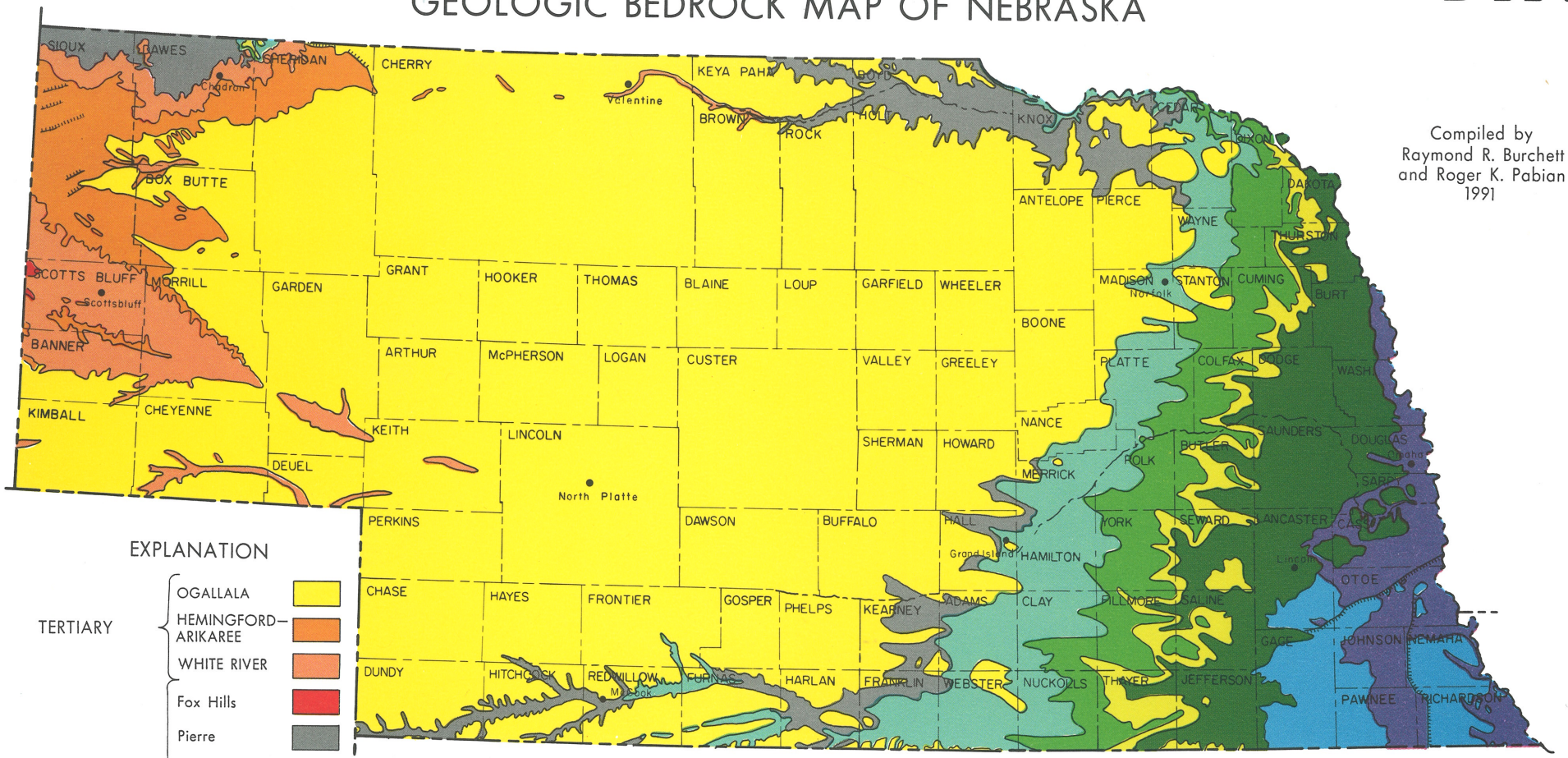
10:30 Drive west to Burr Oak Canyon southwest of Culbertson. We will be crossing both the Frenchman and Republican Rivers and discussing their impact on groundwater and the associated water related subjects. As we cross the Driftwood Creek and enter the canyon area notice the different topographic features and the relationship to the Ogallala that outcrops in the area. Deposits of Ogallala age volcanic ash can be found in this area. At the Burr Oak Canyon site the Ogallala overlies the Cretaceous Pierre Shale. We may be able to view some small springs along the small creek that emerge from the Ogallala that overlies the dense Pierre Shale. This is the only site in Southwestern Nebraska that has native Burr Oak growing in the canyon. This is a very interesting site as the Indians used the area extensively and pieces of pottery has been found along the canyon. Water issues will be discussed and interesting geological information will be shared. Lunch will be provided while we visit and discuss the area's interesting biological and geological features.

1:20 P.M. Drive to Swanson Reservoir and Trenton Dam. View the level of the Lake and the Culbertson Canal that emerges from the Dam. We will discuss the water implications that the Republican River and the Swanson Reservoir has on irrigation in the area. We will view outcrops of Pierre shale that occur below the spillway.

2:30 P.M. Drive to proposed grout testing site south of Palisade, Nebraska. We will discuss the site and the grout testing that is scheduled for later this year. We will also review the geological reasons for picking this site. Refreshments will be served.

4:00 P.M. Drive back to McCook following the Frenchman River to west of Culbertson, then the Republican River back to McCook arriving at the Holiday Inn Express at 5:00 P.M.

GEOLOGIC BEDROCK MAP OF NEBRASKA



Compiled by
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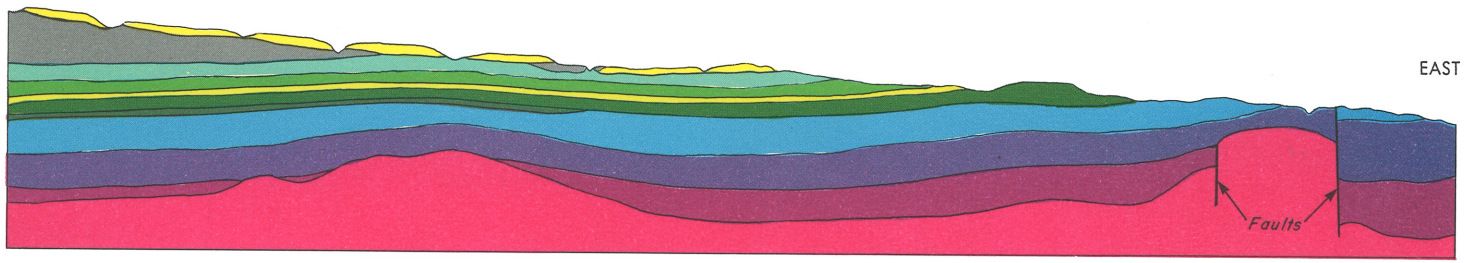
1991

Drafted by Jerry P. Leach

EXPLANATION

- TERTIARY
  - OGALLALA
  - HEMINGFORD–ARIKAREE
  - WHITE RIVER
- CRETACEOUS
  - Fox Hills
  - Pierre
  - Niobrara
  - Carlile
  - Greenhorn–Graneros
  - DAKOTA
- JURASSIC
- PERMIAN
- PENNSYLVANIAN
- MISSISSIPPIAN
  DEVONIAN
  SILURIAN
  ORDOVICIAN
  CAMBRIAN
- PRECAMBRIAN

Fault



GEOLOGIC CROSS SECTION ALONG SOUTHERN NEBRASKA BORDER

20 0 20 40 60
Scale in Miles

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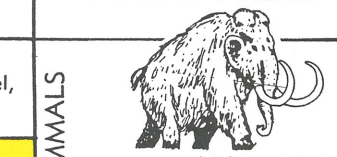
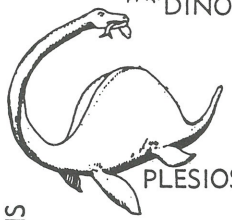
NOTE: Unconsolidated sediments of Recent and Pleistocene age cover the bedrock throughout much of the State and are not shown.

GMC—2

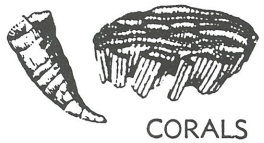
AGE	GEOLOGIC TIME UNITS		ROCK TYPES	MINERAL RESOURCES AND PRODUCTS	TYPICAL FOSSILS
MILLIONS OF YEARS AGO	CENOZOIC (RECENT LIFE)	QUATERNARY (Recent and Pleistocene)	Glacial till, silt, clay, sand, gravel, volcanic ash.	Agricultural soil, water, sand & gravel, volcanic ash.	MAMMALS
1.6		TERTIARY	Sandstone, siltstone, clay, gravel, marl, volcanic ash.	Agricultural soil, water, sand & gravel, volcanic ash, riprap & uranium.	
66	MESOZOIC (MIDDLE LIFE)	CRETACEOUS	Chalk, chalky shale, dark shale, varicolored clay, sandstone, conglomerate	Water, oil & gas, cement, brick, agricultural lime, & other construction materials.	REPTILES
138		JURASSIC	Subsurface only. Sandstones and shales		
205		TRIASSIC			
240	PALEOZOIC (ANCIENT LIFE)	PERMIAN	Shale, limestone, dolomite, gypsum, anhydrite sandstone, siltstone, chert.	Water, agricultural lime, oil, road rock, riprap.	AMPHIBIANS
290		PENNSYLVANIAN	Limestone, shale, sandstone, coal.	Oil, cement, brick, concrete aggregate, lightweight aggregate, road rock, agricultural lime, rip rap, water.	
330		MISSISSIPPIAN	Subsurface only. Limestone, dolomite.	Oil, water.	FISH
360		DEVONIAN	Subsurface only. Dolomite, gray shale.		
410		SILURIAN	Subsurface only. Dolomite.		INVERTEBRATES
435		ORDOVICIAN	Subsurface only. Dolomite, sandstone, shale.		
500		CAMBRIAN	Subsurface only. Dolomite, sandstone.		
570	CRYPTOZOIC (HIDDEN LIFE)	PRECAMBRIAN	Subsurface only. Granite, other igneous rocks, and metamorphic rocks.		?
5,000 ?					


MAMMOTH

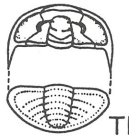

DINOSAUR

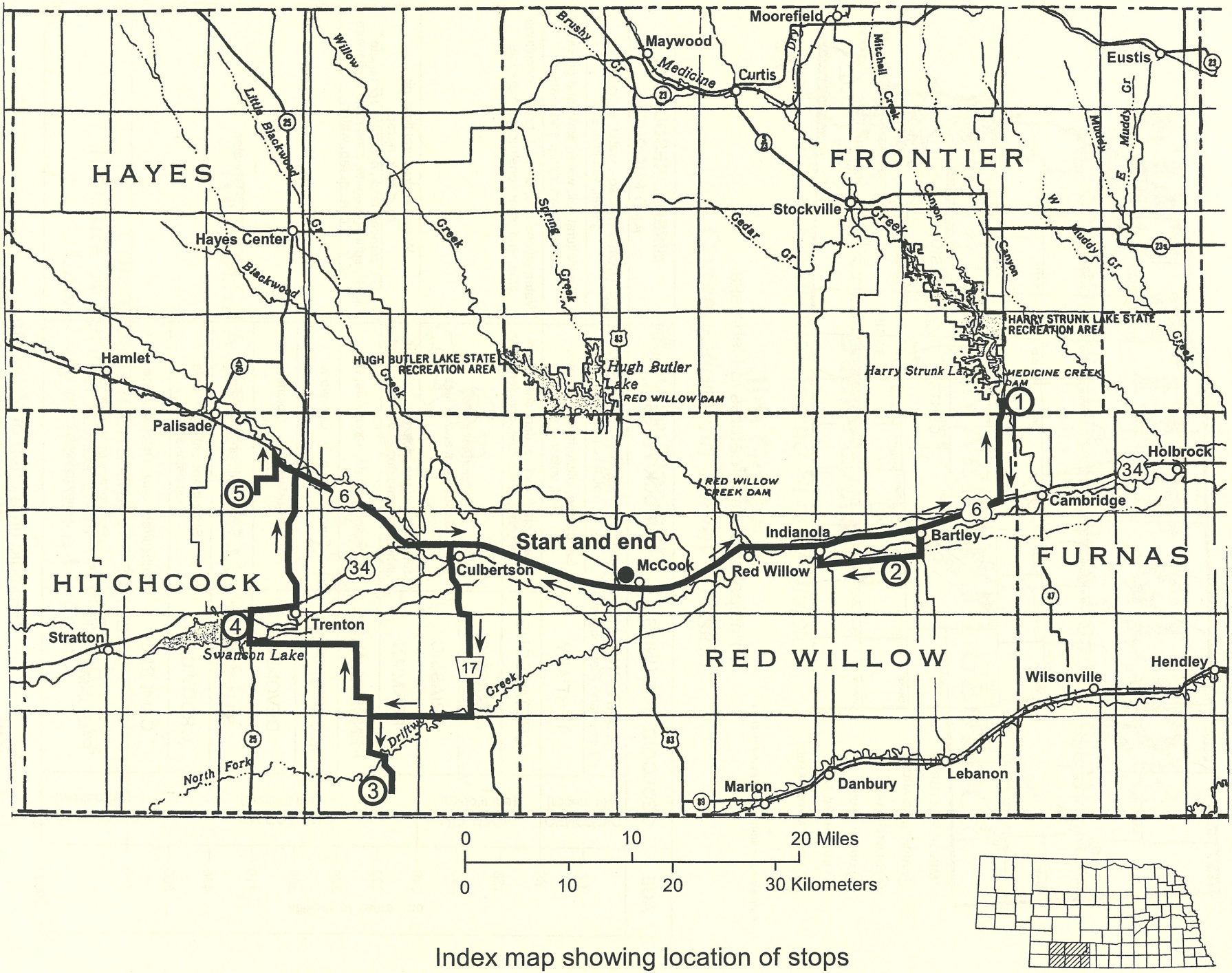

PLESIOSAUR


BRACHIOPOD

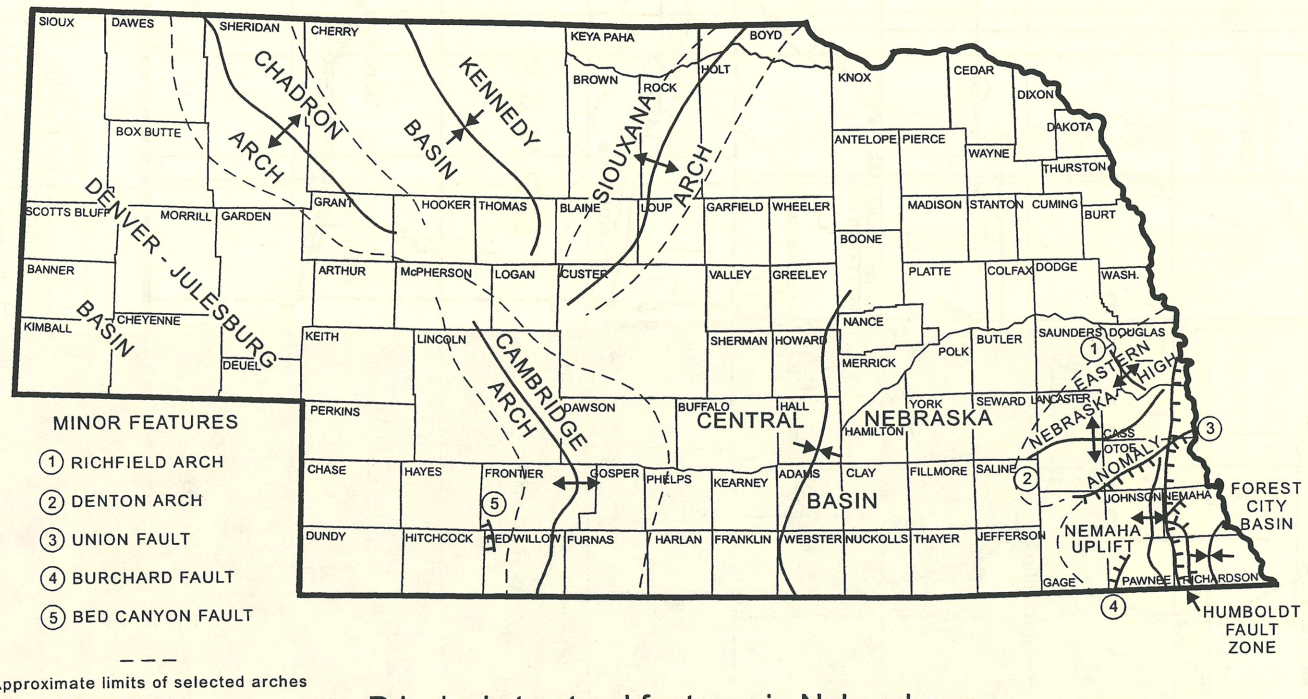

CORALS


CRINOID


TRILOBITE



Index map showing location of stops



Principal structural features in Nebraska

AGE (Millions of Years Ago)	GEOLOGIC TIME UNITS		ROCK TYPES	MINERAL RESOURCES AND PRODUCTS
1.6	CENOZOIC (recent life)	QUATERNARY (Recent and Pleistocene)	Glacial till, silt, clay, sand, gravel, volcanic ash.	Agricultural soil, water, sand and gravel, volcanic ash.
66	CENOZOIC (recent life)	TERTIARY	Sandstone, siltstone, clay, gravel, marl, volcanic ash.	Agricultural soil, water, sand and gravel, volcanic ash, riprap and uranium.
138	MESOZOIC (middle life)	CRETACEOUS	Chalk, chalky shale, dark shale, varicolored clay, sandstone, conglomerate.	Water, oil and gas, cement, brick, agricultural lime, and other construction materials.
205	MESOZOIC (middle life)	JURASSIC	Subsurface only. Sandstones and shales.	
240	MESOZOIC (middle life)	TRIASSIC		
290	PALEOZOIC (ancient life)	PERMIAN	Shale, limestone, dolomite, gypsum, anhydrite sandstone, siltstone, chert.	Water, agricultural lime, oil road rock, riprap.
330	PALEOZOIC (ancient life)	PENNSYLVANIAN	Limestone, shale, sandstone, coal.	Oil, cement, brick, concrete aggregate, lightweight aggregate, road rock, agriculture lime, riprap, water.
360	PALEOZOIC (ancient life)	MISSISSIPPIAN	Subsurface only. Limestone, dolomite.	Oil, water.
410	PALEOZOIC (ancient life)	DEVONIAN	Subsurface only. Dolomite, gray shale.	
435	PALEOZOIC (ancient life)	SILURIAN	Subsurface only. Dolomite.	
500	PALEOZOIC (ancient life)	ORDOVICIAN	Subsurface only. Dolomite, sandstone, shale.	
570	PALEOZOIC (ancient life)	CAMBRIAN	Subsurface only. Dolomite, sandstone.	
5000?	CRYPTOZOIC (hidden life)	PRECAMBRIAN	Subsurface only. Granite, other igneous rocks, and metamorphic rocks.	

Geologic time chart of Nebraska